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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/529,253

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Antonio Pizzi

PIZZI1

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EXAMINER

NGUYEN, VU ANH

ART UNIT

PAPER NUMBER

1796

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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/529,253	<b>Applicant(s)</b> PIZZI ET AL.	
	<b>Examiner</b> Vu Nguyen	<b>Art Unit</b> 1796	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-20 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
  3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)            | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | Paper No(s)/Mail Date. ____.                                      |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>03/25/2005</u> .  | 6) <input type="checkbox"/> Other: ____.                          |

## **DETAILED ACTION**

### ***Claim Objections***

1. Claim 13 is objected to because of the following informalities: In line 4, there is a close parenthesis without an open parenthesis.
2. Claim 6 is objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form. This claim depends on claim 1 and recites that the adhesive contains any combination of two or three diacetals. The diacetals in this claim are unspecified and the language of the claim does not clarify that these diacetals are the same as those of claim 1. Thus, the scope of this claim is broader than the scope of the parent claim.

Appropriate correction is required.

### ***Claim Rejections - 35 USC § 112***

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:  

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.
4. Claims 1-20 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

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5. In claim 1, line 3, the phrase "being able to be prepared from..." makes the scope of the claim indefinite as it is not clear whether diacetals prepared by other unspecified processes are also encompassed. If only diacetals prepared from reactions between C2-C6 aldehydes and C1-C12 alcohols are intended, then the phrase "prepared by" should be used. Claims 2-20 are rejected as they depend on claim 1.

6. Claims 10 and 11 are further rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The recitations of the proportions of two-component mixture as "1/0.2 to 3" (Claim 10) and "1/0.7 to 2.8" (Claim 11) are confusing as it is unclear, take claim 10 for example, whether the proportions are 1/0.2 to 1/3 or 1/0.2 to 3/1.

7. Claim 14 is further rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. In line 3, it is unclear as to which adhesive or resin is being referred to as "a resin or adhesive as above".

### ***Claim Rejections - 35 USC § 103***

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

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9. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

10. Claims 1-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Pizzi et al. (Journal of Applied Polymer Science, 84 (2002), 2561-2571) in view of MacDowell et al. (US 2,360,959).

11. Regarding the limitations set forth in these claims, Pizzi et al. (Pizzi, hereafter) teaches an adhesive with high mechanical strength comprising a resin and an acetal. The acetal includes methylal, ethylal, propylal, butylal, and dioxolane (Table 1). The amount of the acetal in the adhesive is 3, 10, 20 wt% (Tables 1-4; Figures 1-3). The resin includes urea-formaldehyde resins with molar ratios U:F of 1:1.5 and 1:1.3, melamine-urea-formaldehyde resins with molar ratios (M+U):F = 1:1.5 and 1:1.2, and phenol-formaldehyde resin with molar ratio F:P of 1:1.7 (p. 2562, Experimental). The adhesive is used as a glue mix (Titles of Tables) to treat and enhance the strength of wood boards, wood composite boards, resin-impregnated paperboards, wood panels, and particleboards (p. 2561 & p. 2564). Pizzi also teaches that the use of the acetals in the adhesive lowers the load of the expensive resin(s) by one-fourth to one-third and increases the strength performance of wood-panel products by 25-50% (p. 2562, right column). The use of the acetals not only lowers the overall cost but also significantly

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lowers the toxicity of the adhesive composition because the level of formaldehyde emission is minimized to be in compliance with the EPA regulations (p. 2562, right column). The main mechanism by which acetals exert their strength-increasing effects is due to their **excellent solvent and water cosolvent action** on the resin (pages 2568-2570). **Butylal does not give any improvement because it lacks solubility in water.** The solubilities in water for the acetals are methylal (32.3%), ethylal (6.33%), propylal (0.4%), butylal (insoluble) (p. 2567, left column). It is also noted that the wood samples are treated with the glue mix at a temperature of **40-220°C** (p. 2563) and **190-195°C** (p. 2564).

12. Clearly, Pizzi teaches all the limitations set forth in these claims but fails to teach the claimed diacetals.

13. MacDowell et al. (MacDowell, hereafter) teaches a process of making tetra-acetals of glyoxal (Title). These are diacetals which are prepared by reacting glyoxal, an aldehyde, with an alcohol, wherein the latter comprises lower aliphatic alcohols such as methanol, ethanol, isopropanol, butanol, and higher aliphatic alcohols with 6 or more carbons (col. 2, lines 35-44). **[Motivations]** It is also taught that the diacetals of the lower aliphatic alcohols, such as 1,1,2,2-tetramethoxyethane and 1,1,2,2-tetraethoxyethane, are “powerful solvents of medium boiling points for oils, fats, resins and cellulose derivatives. The tetramethyl acetal is soluble in both water and in oils, and it forms a useful coupling agent in systems including such normally immiscible components” (col. 2&3, bridging paragraph).

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14. From the teachings of the prior art, one of ordinary skill in the art would realize that: (1) acetals with high water solubility are most effective at increasing the strength of adhesive resins, (2) of the acetals disclosed by Pizzi, methylal is the only acetal with relatively good water solubility, (3) the lower diacetals taught by MacDowell are powerful solvents for resins and cellulose derivatives, and are highly soluble in water, and (4) methylal is not the best option, despite its good solvent action and good water solubility, because of its low boiling point (42.3°C, Wikipedia), which makes it very volatile at the treatment temperatures taught by Pizzi. It is also known that 1,1,2,2-tetramethoxyethane has a boiling point of about 155°C (<http://www.chemspider.com/Chemical-Structure.482133.html>).

15. For these reasons and in light of the benefits of the lower diacetals taught by MacDowell, it would have been obvious to a person having ordinary skill in the art at the time the invention was made to have replaced the acetals taught by Pizzi with the lower diacetals taught by MacDowell so that the resulting adhesive or glue mix has better strength-improvement effects at even lower loads of resin and acetals and loss of acetals due to evaporation during treatment can be minimized. Such modification would result in more cost saving and much lower emission level of formaldehyde and volatiles. It would also have been obvious to a person having ordinary skill in the art to have employed a mixture of two or more of the diacetals taught by MacDowell in the preparation of the adhesive in order to balance the water solubility, the resin compatibility, and the thermal stability of the diacetals.

***Contact Information***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Vu Nguyen whose telephone number is (571)270-5454. The examiner can normally be reached on M-F 7:30-5:00 (Alternating Friday Off).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Wu can be reached on 571-272-1114. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Vu Nguyen  
Examiner  
Art Unit 1796

/David Wu/  
Supervisory Patent Examiner, Art Unit 1796